

Teaching strategies in mathematics and numeracy skills development of elementary pupils in Caluya District

Solino, Karen D. ✉

Divine Word College of San Jose, Philippines (solinokaren@gmail.com)

Galay-Limos, Jenny A.

Divine Word College of San Jose, Philippines (jennygalay05@gmail.com)



ISSN: 2243-7770
Online ISSN: 2243-7789

OPEN ACCESS

Received: 2 November 2025

Revised: 7 December 2025

Accepted: 10 December 2025

Available Online: 12 December 2025

DOI: 10.5861/ijrsm.2025.25531

Abstract

Mathematics is essential to education because it develops crucial skills such as logical reasoning, critical thinking, and problem-solving, which are vital for success in both academic and real-world settings. Thus, this study examined the teaching strategies used by mathematics teachers in terms of visual aids, manipulative-based instruction, problem-based learning, collaborative learning, and contextualized instruction, and their relationship to the numeracy skills of elementary pupils in the Caluya District in terms of number sense, basic operations, fractions and decimals, measurement, and problem-solving. A descriptive-correlational design was employed, utilizing a researcher-made questionnaire administered to 51 pupils in Grades 4 to 6. Findings revealed that teachers regularly applied a wide range of instructional strategies. Visual aids and collaborative learning, in particular, appeared as the most frequently used and most effective in supporting pupils' learning. Pupils, on the other hand, demonstrated a very high level of numeracy skills. Strengths were observed in number sense, basic operations, and fraction-decimal competencies, while areas needing improvement included reading, measuring instruments, explaining solutions, and solving word problems. Correlation analysis demonstrated a moderately strong and highly significant relationship between teaching strategies and numeracy skills, suggesting that effective instruction contributes significantly to numeracy development. These findings emphasize the crucial role of instructional practices in forming mathematical learning outcomes and underline the need to enhance specific skill areas through targeted teaching approaches. The researcher recommends that school administrators and DepEd officials support the provision of adequate instructional materials, including visual aids, manipulatives, and digital tools, to sustain effective mathematics teaching across grade levels.

Keywords: fundamental operations, teaching strategies, numeracy skills, mathematics education, instructional practices

Teaching strategies in mathematics and numeracy skills development of elementary pupils in Caluya District

1. Introduction

Mathematics is considered a fundamental of education, as it fosters the development of logical reasoning, critical thinking, and problem-solving skills that are necessary for learners' academic success in real life. Recent research emphasizes that mathematical proficiency supports not only higher-level learning but also the development of life skills needed for decision-making and everyday tasks (OECD, 2015; Barwell, 2016). At the elementary level, the growth of numeracy skills, the ability to understand and apply basic ideas in mathematics, is vital because it forms the foundation upon which higher-level mathematical competencies are constructed. Pupils who fail to develop strong numeracy skills early on often experience challenges that persist throughout their academic journey (Li et al., 2025; Aunio et al., 2019). Although mathematics is one of the most important subjects in the curriculum, many students struggle to develop sufficient numeracy skills, leading to learning gaps that affect their overall academic performance.

In the Caluya District, teachers face several challenges in providing mathematics instruction efficiently. Pupils have varied learning paces and cognitive capabilities. These differences, paired with limited instructional resources, create discrepancies in learners' achievement (UNESCO, 2017). To overcome these challenges, one must employ creative and varied teaching strategies that enhance the significance, appeal, and relevance of mathematical concepts to everyday life (DepEd, 2019; Gillies, 2016).

One of the well-known strategies is manipulative-based instruction, which helps pupils transition from concrete to abstract understanding through hands-on experiences (Jones & Tiller, 2017), and contextualized problem-solving, which places education in context in everyday and culturally appropriate ways. Situations to make mathematics more meaningful (DepEd, 2019; Barwell, 2016). Likewise, collaborative learning enhances communication, reasoning, and peer-assisted problem-solving (Gillies, 2016). In contrast, technology-aided teaching—such as digital platforms, visualizations, and interactive tools—increases students' motivation and understanding of abstract mathematical ideas (Bight et al., 2024; OECD, 2015). When combined, these tactics are essential for ensuring that numeracy skills are effectively developed, meeting the needs of specific students as well as broader educational equity.

Research Objectives - This study aimed to determine the relationship between teaching strategies in mathematics and the development of numeracy skills among elementary pupils in the Caluya District. Specifically, it aimed to (1) determine the level of teaching strategies used by mathematics teachers in developing the numeracy skills in terms of visual aids, manipulative-based instruction, problem-based learning, collaborative learning, and contextualized instruction; (2) determine the status of numeracy skills of elementary pupils in the Caluya District; and (3) examine the significant relationship between teaching strategies and the numeracy skills of elementary pupils in the Caluya District.

Significance of the Study - This study is important because it examines how mathematics teaching methods affect elementary students' development of numeracy skills in the Caluya District. Its conclusions will benefit students as well as educators, parents, administrators, and legislators—all of whom play crucial roles in education. The primary beneficiaries of this study are the pupils themselves. The study will assist students in improving their problem-solving skills by identifying the most effective teaching techniques and by strengthening logical reasoning and critical thinking. For teachers, the results will serve as a reference for improving mathematics instruction. By determining which strategies best support numeracy development, teachers can adapt their methods to accommodate diverse learning styles, promote active involvement, and ensure that mathematical concepts are comprehensible, relevant, and significant. The results also highlight the importance of parents' support for their

children's numeracy development at home. Parents who are aware of effective teaching methods can help their children learn more by enabling them to apply mathematics in everyday tasks such as measurement, budgeting, and problem-solving. For the Department of Education (DepEd), the findings will serve as a foundation for developing teacher training programs, professional development initiatives, and support interventions that specifically target gaps in mathematics education among DepEd officials and school administrators. Policymakers and future researchers might use the findings to guide further research on enhancing mathematics teaching methods and instructional models.

Scope and Delimitation of the Study - This study is limited to examining the teaching strategies in mathematics and their relationship to the numeracy skills of elementary pupils in the Caluya District. It covers students in Grades 4-6 enrolled in the 2025–2026 academic year. The emphasis is on understanding the tactics teachers use and determining how these affect the development of students' numeracy skills. The study's scope encompasses only five major teaching approaches that are well recognized in mathematics education: (a) visual aids; (b) manipulative-based instruction; (c) problem-based learning; (d) collaborative learning; and (e) contextualized instruction. These sub-variables were chosen because they support DepEd's learner-centered and contextualized teaching strategies and because studies have demonstrated their efficacy in fostering higher-order thinking and numeracy abilities (DepEd, 2019; OECD, 2015). The study also evaluates students' numeracy abilities in logical thinking, problem-solving, number awareness, and fundamental operations. Only data collected from respondents in the Caluya District will be used to inform the research findings; these findings may not generalize to other districts or contexts with different learning settings and resources.

Since Grades 4 through 6 mark the shift in the elementary curriculum from foundational to more complex mathematical concepts, this study is restricted to these grades. At these points, students should be able to apply higher-order reasoning and problem-solving skills and demonstrate mastery of basic operations (DepEd, 2019). As a result, analyzing their numeracy abilities alongside teaching strategies provides a more comprehensive view of how teaching methods affect students' preparedness for secondary mathematics. In addition, data collection and analysis were conducted in the third quarter of School Year 2025–2026, ensuring that the findings reflect the most recent teaching practices and pupils' performance within the district.

2. Methodology

Research Design - This study utilized a descriptive-correlational design. The descriptive design of the study focused on describing the teaching strategies commonly used by mathematics teachers in the Caluya District. These strategies included visual aids, manipulatives, problem-based learning, collaborative tasks, and contextualized instruction. At the same time, the numeracy skills of pupils in Grades 4 to 6 were described in terms of their performance in basic operations (addition, subtraction, multiplication, and division), problem-solving, and application of mathematical concepts. Moreover, a correlational design was used to test whether a significant relationship exists between teaching strategies and students' numeracy skills.

Respondents of the Study - The respondents of this study were Grades 4-6 pupils at Tinogboc Elementary School, comprising 21, 15, and 15 pupils, respectively, with a total of 51 pupils. Since the population is too small, the researcher used complete enumeration.

Research Instrument - The main instrument of the study was a researcher-made questionnaire composed of two parts: (a) a checklist on teaching strategies and (b) a numeracy test for pupils. The first part determines the teaching strategies employed, while the second assesses pupils' numeracy skills in basic operations, problem-solving, and application. To ensure the validity of the researcher-developed questionnaire, it underwent expert validation by three specialists: two in educational research and one in assessment and evaluation. Their comments and suggestions were incorporated into the final version of the instrument.

Data Gathering Procedure - Permission to conduct the study was first sought from the principal-in-charge of the District of Caluya. After approval, coordination with the school principals and teachers was made to administer

the questionnaires and tests. Teachers completed the teaching strategies checklist, while pupils took the numeracy test during class hours under the researcher's supervision. After collection, all data were organized, aggregated, and prepared for statistical analysis. Data were collected face-to-face over 1-2 days with both teachers and pupils to ensure sufficient time for distributing, explaining, and retrieving responses.

Statistical Treatment of the Data - To treat the data, the weighted mean was used to determine the level of teaching strategies used by mathematics teachers in developing numeracy skills in terms of visual aids, manipulative-based instruction, problem-based learning, and contextualized instruction; and to determine the status of numeracy skills of elementary pupils in the Caluya District. Moreover, to determine the significant relationship between teaching strategies and the numeracy skills of elementary pupils in the Caluya District, Pearson's r moment correlation was used.

Ethical Considerations - The study closely adhered to research ethics guidelines. Data collection was preceded by obtaining informed consent from parents, students, teachers, and school administrators. Respondents were assured that their responses would be kept confidential and used solely for scholarly research and that their participation was entirely voluntary. No identifying information was included in the reporting of results, and respondents had the right to withdraw at any time during the study without penalty. Additionally, all sources and related work used in this research were appropriately acknowledged and cited in accordance with the American Psychological Association (APA) 7th edition citation and referencing guidelines. This prevented plagiarism, maintained academic integrity, and appropriately acknowledged the original authors whose work underpinned this study.

3. Results and Discussions

The mean levels of teaching strategies employed by math teachers to improve students' numeracy abilities in five domains—visual aids, problem-based learning, collaborative learning, manipulative-based instruction, and contextualized instruction—are shown in Table 1. The findings show an overall mean of 3.25, which is considered Very High and explains why the teaching techniques are regularly and successfully used. Visual aids were rated highly among tactics, indicating that images, charts, and posters significantly help students comprehend lessons, remember information, and remain engaged. High to extremely high scores were also given to manipulative-based education, suggesting that practical tools like counters and blocks improve students' comprehension. Nevertheless, some elements of this approach are not always optimized. As a result, problem-based learning received a very high score, underscoring that real-life situations and open-ended problem-solving promote deeper thinking and improved comprehension. Collaborative learning likewise achieved very high ratings, indicating that working with peers, sharing ideas, and group tasks greatly support learners' understanding of numeracy concepts. Lastly, contextualized instruction received high to very high ratings, indicating that when lessons are related to students' real experiences and community settings, learning becomes more meaningful, though some areas require improvement. Overall, the findings clearly demonstrate that mathematics teachers employ a variety of practical strategies that substantially improve learners' numeracy performance.

The findings are supported by studies showing that the use of varied teaching strategies effectively improves students' numeracy skills. Visual aids and manipulative-based instruction help learners better understand abstract mathematical concepts through concrete and engaging representations (Boaler, 2016; Carbonneau et al., 2017). In addition, problem-based and collaborative learning strategies promote more profound understanding and higher-order thinking by encouraging real-world application and peer interaction (Hmelo-Silver, 2017; Johnson & Johnson, 2017). Contextualized instruction further strengthens learning by connecting mathematical concepts to learners' real-life experiences, making numeracy learning more meaningful (Darling-Hammond et al., 2020).

The data in Table 2 reveal that elementary pupils demonstrate a very high level of numeracy, as evidenced by an overall mean of 3.26. among the five skill areas: Number Sense, Basic Operations, Fractions and Decimals, Measurement, and Problem-Solving, with most indicators falling within the High to Very High interpretation.

Pupils show particularly strong competencies in fundamental skills such as reading and comparing figures, performing the four basic operations, and working with fractions and decimals, all of which yielded very high mean scores. Although overall performance is strong, specific skills received lower ratings, particularly in solving word problems, estimating answers, reading measuring instruments, and explaining solutions to others. These findings suggest that although pupils demonstrate commendable overall numeracy proficiency, targeted instructional interventions focused on these specific skills may further strengthen their mathematical understanding and performance.

Table 1

Mean Level of teaching strategies used by mathematics teachers in developing the numeracy skills in terms of visual aids, Manipulative-based instruction, Problem-based learning, Collaborative learning, and Contextualized Instruction

| Indicators: (Visual Aids) | Weighted Mean | Interpretation |
|---|---------------|------------------|
| A. Visual Aids | | |
| 1. I understand the lessons better when there are pictures, charts, or posters. | 3.77 | Very High |
| 2. The use of visual aids helps me recall numeracy concepts easily. | 3.52 | High |
| 3. The lesson becomes more interesting when the teacher uses visual materials. | 3.63 | Very High |
| B. Manipulative-Based Instruction | | |
| 4. I enjoy learning when we use objects like blocks, sticks, or counters in the classroom. | 3.52 | Very High |
| 5. I understand numbers better when I can touch or use learning materials. | 3.55 | High |
| 6. Using manipulatives helps me explain my answers to numeracy problems. | 2.71 | High |
| C. Problem-Based Learning | | |
| 7. I learn to think very deeply when given real-life situations involving numbers. | 3.18 | Very High |
| 8. Solving problems related to real-life situations helps me learn better. | 3.31 | High |
| 9. I learn more when we are allowed to find our own way to solve problems. | 3.19 | Very High |
| D. Collaborative Learning | | |
| 10. I learn better when I work together with my classmates in numeracy activities. | 3.26 | Very High |
| 11. Listening to my classmates' ideas helps me understand the lesson more. | 3.23 | High |
| 12. I enjoy learning through group activities related to numeracy. | 3.02 | Very High |
| E. Contextualized Instruction | | |
| 13. I understand the lessons more easily when examples come from our everyday situations. | 3.23 | Very High |
| 14. I understand numeracy tasks better when they are related to our local culture or community. | 2.45 | High |
| 15. Using familiar situations helps me learn numeracy skills more effectively. | 3.18 | High |
| OVERALL MEAN | 3.25 | Very High |

Legend: 3.26 – 4.00 Very High Level, 2.51 – 3.25 High Level, 1.76 – 2.50 Low Level, 1.00 – 1.75 Very Low Level

Research shows that high numeracy performance among elementary pupils is strongly associated with mastery of number sense, basic operations, and understanding of fractions and decimals (OECD, 2019; Siegler et al., 2016). These foundational skills are essential indicators of overall mathematical proficiency and often lead to high achievement in mathematics. However, studies also indicate that learners who perform well in computation may still experience difficulties in higher-order skills such as word problem solving, estimation, measurement, and explaining solutions. According to Fuchs et al. (2018), word problem solving requires the integration of mathematical reasoning and language comprehension, which makes it more challenging than routine computations. Moreover, Kilpatrick et al. (2017) emphasized that true mathematical proficiency involves conceptual understanding and reasoning, not only procedural fluency. Thus, targeted instructional interventions focusing on these weaker areas are necessary to enhance pupils' mathematical understanding and performance further.

Table 2
Mean Level of Numeracy Skills of Elementary Pupils

| Indicators | Weighted Mean | Interpretation |
|---|---------------|----------------|
| A. Number Sense | | |
| 1. I can read and compare figures. | 3.27 | Very High |
| 2. I understand the value of each number. | 3.23 | High |
| 3. I can arrange numbers from smallest to greatest. | 3.31 | Very High |
| B. Basic Operations | | |
| 4. I can add, subtract, multiply, and divide correctly. | 3.37 | Very High |
| 5. I can solve fundamental word problems. | 3.16 | High |
| 6. I can check my answers using estimation. | 3.15 | High |
| C. Fractions and Decimals | | |
| 7. I can compare fractions and decimals. | 3.58 | Very High |
| 8. I can change simple fractions to decimals. | 3.23 | High |
| 9. I can solve simple fractions to decimal places. | 3.35 | Very High |
| D. Measurement | | |
| 10. I can use the appropriate unit for length, weight, and time. | 3.31 | Very High |
| 11. I can read and use measuring instruments. | 2.94 | High |
| 12. I can estimate measurements before actually taking measurements. | 3.32 | Very High |
| E. Problem-Solving | | |
| 13. I can understand a problem and select the correct operation to use. | 3.35 | Very High |
| 14. I can explain my answer to other people. | 3.11 | High |
| 15. I can show different ways to solve a problem. | 3.23 | High |
| OVERALL MEAN | 3.26 | Very High |

Legend: 3.26 – 4.00 Very High Level, 2.51 – 3.25 High Level, 1.76 – 2.50 Low Level, 1.00 – 1.75 Very Low Level

Table 3
Correlation Coefficients and p-values for H_0

| Variables | Correlation Coefficient | Effect Size (r^2) | Critical Value | t-value | P-value | Interpretation |
|---------------------------------------|-------------------------|-----------------------|----------------|---------|---------|--------------------|
| Teaching Strategies → Numeracy Skills | 0.563 | 0.317 | 2.001 | 5.188 | 0.001 | Highly Significant |

Legend: p-value < 0.001 Highly Significant p-value < 0.05 Significant; p-value > 0.05 Not Significant

The results in Table 3 indicate a moderately strong and highly significant positive relationship between teaching strategies and numeracy skills ($r = 0.563$, $p = 0.001$). This suggests that effective and varied teaching strategies significantly improve students' performance in numeracy. The effect size ($r^2 = 0.317$) further indicates that nearly one-third of the variance in learners' numeracy skills is attributable to the instructional techniques employed. Therefore, improving teaching strategies is crucial to enhancing numeracy results. The study's results are supported by the literature, which indicates a significant positive relationship between teaching strategies and numeracy skills (Boaler, 2016; OECD, 2019). Thus, practical and varied instructional approaches have been shown to improve learners' mathematical performance. Moreover, Hattie (2017) emphasized that quality teaching practices yield moderate to strong effects on student achievement, supporting the finding that a substantial portion of numeracy skills can be attributed to instructional strategies.

4. Conclusions and Recommendations

Based on the study's findings, the following conclusions are drawn: Mathematics teachers in the Caluya District employ teaching strategies at a very high level, particularly in the use of visual aids, problem-based learning, and collaborative learning. These strategies actively support learners' engagement and conceptual comprehension. Elementary pupils demonstrate a very high level of numeracy proficiency, particularly in number sense, basic operations, and fractions and decimals. However, particular areas such as solving word problems, reading measuring instruments, and explaining solutions require further reinforcement. There is a moderately strong and highly significant relationship between teaching strategies and numeracy skills. This indicates that teachers' instructional methods substantially influence pupils' mathematical performance, with nearly one-third of pupils' numeracy outcomes attributable to teaching strategies alone. Effective teaching strategies are therefore essential for strengthening numeracy development, particularly in areas where pupils have demonstrated lower performance.

Based on the conclusions, the following recommendations are proposed: Teachers may continue to use visual aids, manipulatives, and real-life problem-solving tasks, but should adjust these to accommodate varied learning levels among pupils. Curriculum developers and/or mathematics coordinators may strengthen instruction in identified weak areas, specifically word problem solving, measurement skills, estimation, and explaining mathematical reasoning; thus, additional practice activities, guided solutions, and contextualized examples can support improvement. School heads may provide continuous professional development for mathematics teachers, with a focus on strategies such as inquiry-based learning, assessment for learning, and the effective use of educational technology to enhance numeracy instruction. Teachers may encourage greater parental involvement in developing numeracy skills at home through simple tasks like budgeting, measuring household items, and engaging in math-related games. School administrators and DepEd officials may support the provision of adequate instructional materials, including visual aids, manipulatives, and digital tools, to sustain effective mathematics teaching across grade levels. Future researchers may use other variables, such as problem-based learning, that could have a similar effect on students' numeracy skill development.

5. References

- Aunio, P., Korhonen, J., Ragpot, L., Törmänen, M., Mononen, R., & Henning, E. (2018). Multi-factorial approach to early numeracy—The effects of cognitive skills, language factors, and kindergarten attendance on early numeracy performance of South African first graders. *International Journal of Educational Research*, 97, 65–76. <https://doi.org/10.1016/j.ijer.2019.06.011>
- Barwell, R. (2016). Mathematics education and language diversity: The 21st century. *Research in Mathematics Education*, 18(2), 99–102. <https://doi.org/10.1080/14794802.2016.1176598>
- Boaler, J. (2016). Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages, and innovative teaching. Jossey-Bass/Wiley. <https://psycnet.apa.org/record/2016-07883-000>
- Bright, A., Welcome, N. B., & Arthur, Y. D. (2024). The effect of using technology in teaching and learning mathematics on students' mathematics performance: The mediation effect of students' mathematics interest. *Journal of Mathematics and Science Teacher*, 4(2), em059 <https://doi.org/10.29333/mathsciteacher/14309>
- Carbonneau, K. J., Marley, S. C., & Selig, J. P. (2017). A meta-analysis of the efficacy of teaching mathematics with concrete manipulatives. *Journal of Educational Psychology*, 109(3), 380–400. <https://doi.org/10.1037/edu0000138>
- Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, 24(2), 97–140. <https://doi.org/10.1080/10888691.2018.1537791>
- Department of Education (DepEd). (2019). Policy guidelines on the K to 12 basic education program. DepEd Order No. 21, s. 2019. <https://www.deped.gov.ph>
- Fuchs, L. S., Gilbert, J. K., Powell, S. R., Cirino, P. T., Fuchs, D., Hamlett, C. L., & Tolar, T. D. (2018). The role of cognitive processes, foundational math skills, and calculation accuracy in word-problem solving versus pre-algebraic knowledge. *Developmental Psychology*, 54(11), 2084–2098. <https://doi.org/10.1037/dev0000600>
- Gillies, R. M. (2016). Cooperative learning: Review of research and practice. *Australian Journal of Teacher Education*, 41(3), 39–54. <https://doi.org/10.14221/ajte.2016v41n3.3>
- Hattie, J. (2017). Visible learning for mathematics: What works best to optimize student learning. Corwin Press.
- Hmelo-Silver, C. E. (2017). Problem-based learning: What and how do students learn? *Educational Psychology Review*, 29(2), 235–266. <https://doi.org/10.1007/s10648-017-9403-1>
- Johnson, D. W., & Johnson, R. T. (2017). Cooperative learning and teaching citizenship in democracies. *International Journal of Educational Research*, 76, 162–177. <https://doi.org/10.1016/j.ijer.2016.07.002>
- Jones, J. P., & Tiller, M. (2017). Using concrete manipulatives in mathematical instruction. *Dimensions of Early Childhood*, 45(1), 18–23. <https://files.eric.ed.gov/fulltext/EJ1150546.pdf>
- Kilpatrick, J., Swafford, J., & Findell, B. (2017). Adding it up: Helping children learn mathematics. National

Academy Press.

[https://daneshnamehicsa.ir/userfiles/file/manabeh/manabeh02/adding%20it%20up%20helping%20children%20learn%20mathematics%20\(3\).pdf](https://daneshnamehicsa.ir/userfiles/file/manabeh/manabeh02/adding%20it%20up%20helping%20children%20learn%20mathematics%20(3).pdf)

Li, X., Ching, B. H. H., Tan, L., Li, X., Li, J., & Chen, T. T. (2025). The Relation Between Spontaneous Focusing on Numerosity and Mathematics Performance: A Meta-Analysis. *Educational Psychology Review*, 37(2), 1-44. DOI: 10.17161/fec.v44i5.6686

Organisation for Economic Co-operation and Development (OECD). (2015). Students, computers, and learning: Making the connection. OECD Publishing. <https://doi.org/10.1787/9789264239555-en>

United Nations Educational, Scientific, and Cultural Organization (UNESCO). (2017). A guide for ensuring inclusion and equity in education. *UNESCO Publishing*. <https://unesdoc.unesco.org/ark:/48223/pf0000248254>

Siegler, R. S., Thompson, C. A., & Schneider, M. (2016). An integrated theory of whole number and fraction development. *Cognitive Psychology*, 62(4), 273–296. <https://doi.org/10.1016/j.cogpsych.2011.03.001>